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Intl.

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Applicant : Motoshige SUMINO et al.

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**THIRD PRELIMINARY AMENDMENT**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

August 30, 2006

Sir:

Prior to examination on the merits of the above-identified patent application, please amend the application as follows:

IN THE SPECIFICATION:

Table 1 on page 42 has been amended as follows:

Table 1

Exam.	aryl halide	product	Physical property data
1	4 - bromotoluene	4 - methylphenyl diphenylsulfonium bromide	yield: 76%; m.p.; 243.1-243.6 °C; <sup>1</sup> H-NMR(400MHz, CDCl <sub>3</sub> ) δ=7.84-7.71(12H, m, Ph), 6.73(2H, d, J=8.54Hz, Ph), 2.48 (3H, s, CH <sub>3</sub> ); IR(KBr) (cm <sup>-1</sup> )=3069, 3045, 2984, 2359, 1591, 1475, 1446, 1309, 1188, 1155, 1066, 995, 808, 763, 686
2	3 - bromotoluene	3 - methylphenyl diphenylsulfonium bromide	yield: 77%; m.p.: 126.7-128°C; <sup>1</sup> H-NMR(400MHz, CDCl <sub>3</sub> ) δ=7.87-7.84(4H, m, Ph), 7.82-7.72 (6H, m, Ph), 7.64-7.57 (4H, m, Ph), 2.46(3H, s, CH <sub>3</sub> ); IR(KBr) (cm <sup>-1</sup> )=3440, 3079, 3030, 1622, 1599, 1476, 1445, 1317, 1068, 995, 789, 767, 750, 684
3	2 - bromotoluene	2 - methylphenyl diphenylsulfonium bromide	yield: 64%, m.p.: 228.6-228.9°C; <sup>1</sup> H-NMR(400MHz, CDCl <sub>3</sub> ) δ=7.86-7.73(10H, m, Ph), 7.68-7.65 (1H, m, Ph), 7.55-7.32 (2H, m, Ph), 7.09(1H, J=8.30Hz, Ph), 2.66(3H, s, CH <sub>3</sub> ); IR(KBr) (cm <sup>-1</sup> )=3476, 3404, 3077, 2993, 2338, 1591, 1476, 1446, 1278, 1178, 1159, 1072, 995, 765, 688
4	1-bromo-4-tert-butylbenzene	4 - tert - butylphenyldiphenylsulfonium bromide	yield: 79%; m.p.: 232.0-233.2°C; <sup>1</sup> H-NMR(400MHz, CDCl <sub>3</sub> ) δ=7.87-7.70(14H, m, Ph), 1.35(9H, s, (CH <sub>3</sub> ) <sub>3</sub> ); IR(KBr) (cm <sup>-1</sup> ) =3045, 2966, 1587, 1473, 1444, 1396, 1363, 1309, 1194, 1178, 1113, 1072, 995, 852, 823, 763, 688

5	1-bromo- 4 - cyclohe- xylbenz- ene	4 - cyclohexylph- enyldiphenyl- sulfonium bromide	-	yield: 93%; m.p.: 232.0-233.2°C; <sup>1</sup> H-NMR(400MHz, CDCl <sub>3</sub> ) δ=7.85- 7.54(12H, m, Ph), 7.54-7.51(2H, m, Ph), 2.61(1H, dt, J=6.35Hz, J=2.44Hz, CH), 1.95-1.81(4H, m, CH <sub>2</sub> ), 1.76(1H, dddd, J=1.47Hz, J=2.68Hz, J=8.00Hz, J=13.03Hz, CH), 1.30-1.19(4H, m, CH <sub>2</sub> ), 1.25(1H, dddd, J=3.14Hz, J=7.20Hz, J=8.70Hz, J=25.64Hz, CH <sub>2</sub> ); IR(KBr) (cm <sup>-1</sup> ) =3412, 2924, 2851, 2091, 1585, 1475, 1444, 1410, 1327, 1186, 1111, 1068, 1022, 997, 835, 754, 684
6	1-bromo- 4 - methoxy- methoxy- benzene	4 - methoxypheny- ldiphenylsul- f o n i u m bromide	-	yield: 91%; m.p.: 155.0-156.3°C; <sup>1</sup> H-NMR(400MHz, CDCl <sub>3</sub> ) δ=7.89(2H, dd, J=1.95Hz, J=7.08Hz, Ph), 7.80-7.68(10H, m, Ph), 7.23(2H, dd, <u>J=1.95</u> <u>J=1.95</u> Hz, <u>J=7.08</u> Hz, <u>Ph</u> ), 3.92(3H, s, CH <sub>3</sub> O); IR(KBr) (cm <sup>-1</sup> )=3481, 3393, 3080, 2841, 2575, 2019, 1587, 1495, 1475, 1444, 1415, 1311, 1269, 1178, 1116, 1070, 1016, 939, 856, 837, 798, 756, 686

Table 2 on page 43 has been amended as follows:

Table 2

Exam.	aryl halide	product	Physical property data
7	1-bromo-3-methoxybenzene	3 - methoxyphenyl diphenylsulfone in um bromide	yield: 77%; m.p.: 88.4-89.8°C; <sup>1</sup> H-NMR(400MHz, CDCl <sub>3</sub> ) δ=7.89-7.83(4H, m, Ph), 7.80-7.67(6H, m, Ph), 7.63(1H, s, Ph), 7.59(1H, t, J=8.18Hz, Ph), 7.25(1H, d, J=8.18Hz, Ph), 7.21(1H, d, J=8.18Hz, Ph), 3.89(3H, s, CH <sub>3</sub> O); IR(KBr) (cm <sup>-1</sup> )= 3466, 3387, 3084, 3032, 3015, 2976, 2839, 1591, 1483, 1444, 1427, 1286, 1250, 1188, 1072, 1032, 997, 875, 785, 761, 684
8	1-bromo-2-butoxybenzene	4 - butoxyphenyl diphenylsulfone in um bromide	yield: 78%; m.p.: 130.4-132.5°C; <sup>1</sup> H-NMR(400MHz, CDCl <sub>3</sub> ) δ=7.87(2H, d, J=8.79Hz, Ph), 7.80-7.68(10H, m, Ph), 7.19(2H, d, J=9.03Hz, Ph), 4.06(2H, t, J=6.34Hz, OCH <sub>2</sub> ), 1.79(2H, dt, J=6.34Hz, J=21.49, CH <sub>2</sub> ), 1.49(2H, dq, J=7.45Hz, J=21.49Hz, CH <sub>2</sub> ), 0.97(3H, t, J=7.45Hz, CH <sub>3</sub> ); IR(KBr) (cm <sup>-1</sup> )= 3483, 3406, 3192, 3080, 3022, 2957, 2874, 2575, 1900, 1767, 1682, 1587, 1475, 1444, 1415, 1309, 1261, 1178, 1120, 1068, 1022, 999, 964, 856, 763, 688
9	1-bromo-4-tert-butoxybenzene	4 - tert - butoxyphenyl diphenylsulfone in um bromide	yield: 40%; m.p.: 89.4-95.5°C; <sup>1</sup> H-NMR(400MHz, CDCl <sub>3</sub> ) δ=7.86-7.81(6H, m, Ph), 7.74-7.28(6H, m, Ph), 7.23(2H, d, J=9.03Hz, Ph), 1.49(9H, s, CH <sub>3</sub> ); IR(KBr) (cm <sup>-1</sup> )= 3053, 2972, 2872, 1579, 1491, 1475, 1442, 1396, 1369, 1253, 1163, 1068, 997, 898, 866, 765, 744, 684

10	1-bromo-4-methylthiobenzen	4-methylthiophenyldiphenylsulfonium bromide	yield: 83%; m.p.: 160.8-161.8°C; $^1\text{H-NMR}$ (400MHz, $\text{CDCl}_3$ ) $\delta=7.86$ -7.78(6H, m, Ph), 7.76-7.69(6H, m, Ph), 7.48(2H, d, $J=8.54\text{Hz}$ , Ph), 2.53(3H, s, $\text{CH}_3\text{S}$ ); IR(KBr) ( $\text{cm}^{-1}$ )= 3447, 3045, 2990, 2943, 1566, 1547, 1475, 1441, 1402, 1313, 1201, 1178, 1099, 1062, 997, 825, 804, 761, 748, 682
11	1-bromo-2,4,6-trimethylbenzene	2, 4, 6-trimethylphenyldiphenylsulfonium bromide	yield: 23%; m.p.: 202.0-202.6°C; $^1\text{H-NMR}$ (400MHz, $\text{CDCl}_3$ ) $\delta=7.80$ -7.76(6H, m, Ph), 7.70-7.68(4H, m, Ph), 7.23(2H, s, Ph), 2.43(3H, s, $\text{CH}_3$ ), 2.36(6H, s, $\text{CH}_3$ ); IR(KBr) ( $\text{cm}^{-1}$ )= 3449, 3387, 3057, 2991, 1597, 1572, 1471, 1446, 1385, 1300, [[11]] 1172, 1039, 997, 879, 754, 686

Table 4 on page 45 has been amended as follows:

Table 4

Exam.	aryl halide	product	Physical property data
17	bis(4-methylphenyl)sulfoxide	bis(4-methylphenyl)phenylsulfonium bromide	yield: 90%; m.p.: 207.8-208.9°C; $^1\text{H-NMR}$ (400MHz, $\text{CDCl}_3$ ) $\delta=7.78$ (2H, d, $J=7.81\text{Hz}$ , Ph), 7.73-7.68(7H, m, Ph), 7.48(4H, d, $J=8.55\text{Hz}$ , Ph), 2.45(6H, s, $\text{CH}_3$ ); IR(KBr) ( $\text{cm}^{-1}$ )= 3617, 3065, 3003, 2955, 1589, 1491, 1443, 1402, 1315, 1290, 1186, 1124, 1068, 1014, 825, 806, 760, 688

18	bis(4-methoxyphenyl)sulfoxide	bis(4-methoxyphenyl)phenylsulfonium bromide	yield: 94%; colorless oily substance; $^1\text{H-NMR}$ (400MHz, $\text{CDCl}_3$ ) $\delta=7.81$ (4H, d, $J=8.79\text{Hz}$ , Ph), 7.72-7.69(5H, m, Ph), 7.20(4H, D, $J=8.79\text{Hz}$ , Ph), 3.90(6H, s, $\text{OCH}_3$ ); IR(KBr) ( $\text{cm}^{-1}$ )= 3400, 3086, 2976, 2841, 2575, 1589, 1495, 1445, 1416, 1311, 1271, 1180, 1126, 1076, 1018, 837, 798, 752, 686
19	bis(4-tert-butylophenyl)sulfoxide	bis(4-tert-butylophenyl)phenylsulfonium bromide	yield: 91%; m.p.: 245.6-245.9°C; $^1\text{H-NMR}$ (400MHz, $\text{CDCl}_3$ ) $\delta=7.86$ -7.82(6H, m, Ph), 7.76-7.71(7H, m, Ph), 1.35(9H, s, $\text{CH}_3$ ); IR(KBr) ( $\text{cm}^{-1}$ )= 3067, 2964, 2872, 1587, 1493, 1471, 1446, 1400, 1363, 1269, 1203, 1117, 1072, 1009, 997, 850, 837, 767, 690
20	bis(4-trifluoromethylphenyl)sulfoxide	bis(4-trifluoromethylphenyl)phenylsulfonium bromide	yield: 39%; m.p.: 283.9-284.8°C; $^1\text{H-NMR}$ (400MHz, $\text{CDCl}_3$ ) $\delta=7.87$ -7.85(6H, m, Ph), 7.81-7.04(7H, m, Ph); IR(KBr) ( $\text{cm}^{-1}$ )= 3073, 3046, 2985, 1578, 1477, 1447, 1327, 1138, 1062, 995, 837, 769, 750, 684
21	bis(4-fluorophenyl)sulfoxide	bis(4-fluorophenyl)phenylsulfonium bromide	yield: 72%; m.p.: 241.6-242.1°C; $^1\text{H-NMR}$ (400MHz, $\text{CDCl}_3$ ) $\delta=8.13$ -8.09(4H, m, Ph), 7.89-7.86(2H, m, Ph), 7.79-7.70(3H, m, Ph), 7.46-7.41(4H, m, Ph); IR(KBr) ( $\text{cm}^{-1}$ )= 3574, 3480, 3090, 3047, 3018, 2976, 1585, 1491, 1448, 1408, 1300, 1240, 1163, 1105, 1070, 1008, 848, 814, 756, 686

22	bis(4-chlorophenyl)sulfoxide	bis(4-chlorophenyl)phenylsulfonium bromide	yield: 66%; m.p.: 179.3-180.4°C; $^1\text{H-NMR}$ (400MHz, CDCl <sub>3</sub> ) δ=8.02-7.98(3H, m, Ph), 7.92-7.76(2H, m, Ph), 7.75-7.65(8H, m, Ph); IR(KBr) (cm <sup>-1</sup> )= 3069, 2984, 1570, 1475, 1446, 1394, 1309, 1157, 1039, 1064, 997, 829, 769, 746, 686
<u>23</u>	<u>bis(4-hydroxyphenyl)sulfoxide</u>	<u>bis(4-hydroxyphe-nyl)phenylsulfonium bromide</u>	yield: 69%; m.p.: 252.6-253.0°C; $^1\text{H-NMR}$ (400MHz, CDCl <sub>3</sub> ) δ=7.80-7.70(3H, m, Ph), 7.64-7.62(6H, m, Ph), 7.13-7.10(4H, m, Ph), 3.30-3.29(2H, brd, OH); IR(KBr) (cm <sup>-1</sup> )= 3061, 1595, 1579, 1496, 1441, 1342, 1288, 1224, 1109, 1072, 846, 744, 719, 679